

GREEN. (Jas. S.)

A REVIEW

OF THE

SURGERY OF THE KNEE JOINT

FOR THE

LAST FIFTY YEARS.

BY

JAMES S. GREEN, M. D.

Reprinted from the *Transactions of the Medical Society of New Jersey.*



L. J. Hardham, Printer, 243 & 245 Market Street, Newark, N. J.

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During the last fifty years, so great and wonderful have been the advances and discoveries in every science and art that could an audience of those distinguished men, at whose feet the elder members of this Society sat as scholars, be called together in this place and be told what had been done since they instructed us at the beginning of the last half of this century, how startled would they be to hear what were our daily practices and habits, shaped by the facilities afforded by recent discovery and invention. That we read by the aid of the electric light full accounts of every day's occurrences in Europe, in the evening paper of the same day in which they happen; that flashed under the ocean, we send messages of inquiry to those who are abroad; and received their reply in a few hours; that we speak by telephone to a friend miles away, and converse with him as we would were we face to face; that space has almost been annihilated by steam on land and water; how the sun instantaneously paints our pictures; how the spectroscope discovers the metallic constituents of the heavenly bodies. This respected audience would feel that they had been called to wonderland; but how would they be shocked at our disloyalty to their precepts, when we informed them that we had set at defiance nearly every rule and law which they had

enunciated ; that we had proved that they were mistaken in nearly all their theories and conclusions ; that we invade without a shudder or foreboding the abdominal cavity, remove any organ that offends, repair and shorten intestines, open and wash out the peritoneum to remove septic and purulent accumulations, aspirate every closed cavity, excepting only the heart ; that we can locate and remove successfully tumors of the brain ; that many of our operations are bloodless (by the use of Esmarch's method), which in former days were accompanied by a deluge of blood ; that many patients, well-nigh dead from traumatic haemorrhage or surgical shock, have been revived and their heart's action sustained through difficult operations to a successful issue by the hyperdermic use of brandy ; that amputations, involving large surfaces and vessels, when sealed by antiseptic dressings and ligatures accompanied with the drainage tube, when uncovered at the end of several days, are found healed without suppuration.

All this and very much more equally wonderful things are daily done without pain or consciousness on the part of the patient, because of the God-sent gift of anæsthesia, while the death rate of surgical cases is reduced to a minimum by the practice of the antiseptic rules of Listerism.

We might continue to recite what has been done in medicine, therapeutics, pharmacy, microscopy, pathology, bacteriology, ophthalmoscopy, and laryngoscopy, and the several specialties, until we ourselves should realize during the enumeration, the many wonders which daily pass unnoticed by us, because of our familiarity with them, and appreciate the mighty progress that has been made in our science during the last fifty years.

The advances made in the surgery of the knee-joint,

during the last half century, which is the subject of this essay, we propose to consider under the following heads:

1. What were the accepted laws and means which were laid down and used at the earlier part of the period which we are considering.

2. What is now recognized as the proper treatment—operative and mechanical—of diseases of the knee-joint.

Little progress, if any, was made in the treatment of diseases of the knee-joint from the earliest times until the beginning of the last half century, in proof of which I quote from the "Surgical Dictionary of Samuel Cooper," London edition, published in 1838; page 862: "The works of Hippocrates, Celsus, Rhazes, Hieron, Fabricius and others, compared with modern surgical works, will soon convince us that the practice of the ancients in the treatment of diseased joints does not differ much from the plan now pursued by the best modern surgeons."

The fear entertained by the earlier surgeons of wounds opening joints, is set forth in "Dorsey's Surgery," vol. I, page 103, published in 1818: "So great is the danger to the life of the patient that it always becomes a serious question with his surgeon in such wounds of the elbow, knee or ankle, whether an amputation ought not to be immediately performed."

Dr. Physick recommended in suppurative synovitis as the best treatment, "a very active and long-continued purging. The best cathartic is jallap and cream of Tartar every day or every two days."—*Ibid*, vol. II, page 268.

Dr. Wm. Gibson, in his "Surgery," published in 1827, vol. II, page 44, under the head of "White Swelling," says: "For a morbid alteration of structure in the synovial membrane, there is unfortunately in the generality of

cases, but one remedy—amputation—and this does not always succeed."

Again *Ibid*, page 45: "In every variety of white swelling, where matter has formed in the joint, the surgeon ought carefully to abstain from letting it out, as such an operation has been found by experience only to aggravate the symptoms, and indeed, in some cases, to produce most alarming symptoms, and even fatal effects."

The same author, page 48, writing on the subject of Hydrarthritis, states: "Some practitioners advise tapping the joint; but no prudent or sensible man would incur the risk of violent inflammation, suppuration, or perhaps, death, when it is well-ascertained that there is no certainty of radical cure being effected by the operation."

Again at page 56, the same author, treating of movable cartilages in the knee-joint, says: "The danger of cutting down into the cavity of a joint, under any circumstances, is continuously imminent; such an operation should, therefore, if possible, be always avoided."

We might continue to quote from all the early authors to show that the invasion by operative procedure of any such cavity lined by a serous or synovial membrane, was a most unwarrantable procedure, unjustifiable under almost any circumstance, and even Sir Benjamin Brodie, whose views on joint diseases where far in advance of his times, recommends in dropsy of the knee-joint, when the distention has become unbearable, to puncture the cavity with an instrument, no larger than a couching needle, and extract sufficient fluid by a cupping-glass to give relief. When, however, suppuration has taken place, the lancet may be used; but the practice is recommended with so much caution that it almost amounts to a prohibition.

Samuel Cooper, in *Surgical Dictionary*, page 853, says:

"Circumstances do not justify the making of an opening into the knee-joint, but excessive distention in some neglected cases might certainly be an urgent reason for such an operation. Also if the complaint should resist all other plans of treatment, and the irritation of the tumor greatly impair the weak constitution, the practice might be justifiable." Same, page 850, in speaking of loose bodies in the knee-joint: "If we except making incisions into the joint for the purpose of extracting these cartilaginous formations, we are not acquainted with any means of freeing a patient from the inconvenience of this complaint. To this plan, the dangers attendant to all wounds of so large an articulation as the knee-joint, are, as a rule, a serious objection."

This decided opposition of surgeons to interfere with a serous or synovial membrane, obtained as late as 1860. I quote from "Gross' Surgery," vol. I, page 981 and 991, writing of wounds of the joints, he says: "All officious interference by finger, probe or other instrument, must be scrupulously avoided, as the synovial membrane is eminently intolerable and resentful of manipulation, however gently conducted, bearing in this respect the greatest possible resemblance to the peritoneum, which—as everyone knows—can hardly be touched without becoming inflamed." Of operative interference in suppurative synovitis, he says: "The incision need not, nay, must not, be direct, but sub-cutaneous, small, not large, and when the precaution is observed and the orifice is immediately closed to prevent admittance of air, nothing but good can result from it." In works above quoted, as in those of any contemporaneous authors on surgery, we find no hint that the use of extension and counter-extension (to keep the inflamed surfaces of the joint apart and overcome the reflex contraction of the muscles controll-

ing the part), was thought of. Rest, counter-irritation and internal remedies, purgatives, murcurials, antimonials, blood-letting and puncture by small opening, made after sliding the skin, by the point at which the joint was to be penetrated, are the only means that were recommended. Mechanical appliances were unknown, except the use of the posterior splint applied to the back of the whole limb. Even this precaution against deformity and insurance of rest was not used until a comparatively recent period. Free incision into a suppurating knee-joint was deprecated as late as the year 1852, in Miller's "Principles of Surgery." Under the title Acute Synovitis, he writes: "The interior of a joint being in truth converted into an acute abscess, the general rules of surgery are not (as a rule) to be departed from. An early incision should be practiced. This, however, can only be had recourse to when the symptoms are so very distinct as to leave not the slightest doubt of suppuration having occurred. To plunge a bistoury into the cavity of a joint filled with serous or sero-purulent fluid would be a most unwarrantable procedure, rendering disorganization certain, when, otherwise, all might have been saved. If the fluid is purulent, the natural process of pointing will soon disclose the real state of matters." In hydrathosis, the same author condemns the tapping of the joint and the use of injection of iodine, as more likely to effect disorganization than its cure.

The invasion of the knee-joint with free incision was one of the first advances which marked a change in the treatment of suppurative synovitis. It had been hinted at as a practical expedient by Boyer and Recamier, "Malgaine's Operative Surgery, 1846," p. 159. But the credit of having first put this procedure into practice is due to Doctor Lewis A. Sayre, of New York, in 1840 and

1844, although Erichsen, in his "System of Surgery," p. 590, gives Mr. John Gay, of London, as having first advocated the measure. So also Holmes Cook, in his work on diseases of joints, London, 1867, p. 66, says: "The practice of laying open large joints by long incision, in certain states of disease, has been known to surgeons for many years." Mr. Gay carried out the practice yet further. He first freely opened diseased joints in 1851. "At that time," he observes, "the joints were sealed against all interference, beyond that which Sir Benjamin Brodie recommended, namely, a simple opening in case of abscess, on pain of the destruction to the limb and the chance of death to the patient. I was led to the practice by observing constantly, in the interior of joints, portions of shed cartilage or bone, or other débris, and felt assured that unless they were released they would prolong the disease by retarding the natural process of restoration."

Being well assured that the claim of Mr. John Gay was not well founded, I addressed the following letter to Dr. Sayre, and received the reply which I have copied into this essay :

ELIZABETH, N. J., March 13, 1888.

DEAR DOCTOR SAYRE :

I am writing a surgical paper, "A Review of the Surgery of the Joints," showing a change in the theory and practice in the last half century. One part of the paper relates to the breaking down of the law forbidding free opening of joints. As I remember, you were among the first, if not the first, who dared to freely open and drain suppurating joints, and was for this offence banished, as a young man, from Dr. Parker's clinic, for opening, in his absence, the ankle-joint of a young woman who subsequently got well with a good joint. I should like the date (if you can give it) and a little history of the case.

Sincerely yours,

JAMES S. GREEN.

285 Fifth Avenue, NEW YORK, March 19th, 1888.

JAS. S. GREEN, M. D.

MY DEAR DOCTOR:—I remember very well the case of the ankle-joint to which you refer, and which I opened at Dr. Parker's Clinic in the old college in Crosby street, in the summer of 1844, while I had charge of his Clinic during his summer vacation.

A young woman presented herself with suppuration of the ankle-joint, the result of chronic inflammation from a severe strain or wrench of the joint some months before. I told the students that *pus* was a foreign body, and must be *let out* as soon as detected, no matter where it was found—whether in *a joint or anywhere* else, I told them that an empty house was always better than a bad tenant, and I therefore made a free incision into the joint and gave her immediate relief. I then cut a piece of thick sole-leather in the form of a stocking, softened it in cold water and moulded it to the foot and leg, and secured it with a snugly-applied roller bandage, thus securing absolute immobility of the joint and perfect rest to the parts. I filled the wound with Peruvian balsam, covered it with oakum to absorb the pus, and secured it by a firmly-applied roller bandage. I then narrated to the class the case of a knee-joint that I had freely opened in the winter of 1840, nearly two years before I had graduated, and before I had been told the danger of opening joints. But as this man had made a complete recovery with a perfectly useful leg—although it had been condemned to amputation by all the surgeons at the New York Hospital, and had actually been on the operating table and Dr. A. C. Post was about to perform the operation when the man refused and ran away—I therefore took the liberty of differing from the teachings of the past, and told the students that whenever they were positively satisfied that *pus* was in a joint to *immediately let it out*, and to do it with such a *free* incision and in such a position as to insure *free drainage*, and they need have no fear of the result.

Dr. Cooper, who afterward became such a distinguished surgeon on the Pacific coast and died in San Francisco, was a student at the time, told me some years before he died, that it was seeing that case and listening to that lecture which induced him to apply the treatment in the first case that came to him after his arrival in San Francisco, and the result was perfectly successful. Dr. Cooper published his case, I think, in 1848, and it is generally believed to be the first published case on record.

Dr. Parker returned to the city some two weeks after this lecture, and some meddlesome persons informed him of my dangerous teachings, and I was severely reprimanded. But Dr. Alexander H. Stevens, who was then President of the college, went with me to Hester street to see the patient, who was doing so well that he was satisfied that I *could not have opened the joint*, but simply had opened an extra capsular abscess ; and, upon this convincing the faculty that I had *not intentionally opened a joint*, my apparent mistake was overlooked, and I was not removed from my position as Prosector to the Professor of Surgery, but strongly cautioned about ever teaching such dangerous dogmas in future.

I was perfectly certain all the time that I had opened that same ankle-joint, but I did not want to quarrel over the matter, as I was not particularly anxious at that time to sever my connection with the college.

At the present time, with the wonderful improvements in antiseptic surgery, it is an established treatment in all parts of the world. But if these reminiscences of my earlier work are of any value to you, you are most welcome to them.

Your sincere friend,

LEWIS A. SAYRE.

The propriety and necessity of the free incision of suppurating joints is now recognized by all modern surgeons, the operation being performed under antiseptic precautions. I quote from some of the recent authorities. Erichsen says: "The practice of making free incisions into a suppurating joint is a great improvement on the former method of merely puncturing it. If a small aperture only is made, air gets admixed with the pus, which becomes offensive and irritating ; and, being unable to escape freely, sinks to the bottom of the articulation with débris of the disintegrated cartilages, gives rise not only to much local mischief, but to proportional constitutional disturbances. By freely laying open the joint, all this is avoided. Exit is given to the pus

through one or two incisions that extend the whole length of the articulation."

In "Heath's Dictionary of Practical Surgery," vol. I, 1886; page 849, under the title "Pyemic Joint Diseases," we read: "The affection of the joint most often met with in acute pyæmia, is a rapidly progressive synovitis. The process is one of extreme acuteness and virulence. In no other form of joint inflammation are the tissues involved so quickly destroyed. The joint may be found full of pus, and the cartilages extensively ulcerated within forty-eight hours after the first sign of inflammation. Early aspirations should therefore be made, and if the fluid be purulent an incision must be made into the joint in such position as will insure free drainage; the synovial cavity washed out with a mild antiseptic solution (equal to acid carbolic 1-80.), and a drainage tube left in the wound."

Richard Barwell, in his "Treatise of Diseases of the Joints," 1881, p. 87, recommends free incision of the knee-joint in suppurative synovitis, under antiseptic precautions, the washing out of the cavity with a carbolic solution. The same author, in the "International Encyclopædia of Surgery," 1844, edited by Ashurst, vol. IV, p. 288, recommends free incision, but makes this remark: "For some months I have given up carbolic acid and the spray, the complicated dressings, etc., of Prof. Lister's method, and found that abundant syringing of the cavity with a five per cent. solution of boroglyceride and dressing with the same, is safer and quite as efficacious."

Dr. Sayre, writing to me upon his present practice in suppurative synovitis, says: "But now I simplify the matter and shorten the process of healing by freely opening the joint, *thoroughly scraping* and *removing all abnormal tissues*, washing out with bi chloride of mercury solution,

drain by tubes, and immediately close the *entire* wound, except at orifices of drain-pipes, and cover all with anti-septic dressing, and get perfect union in a short time, thus saving many months of suppuration, that I formerly had."

Howard Marsh, "Diseases of Joints," 1886, p. 445: "Should suppuration take place in the course of strumous synovitis, the matter should at once be evacuated by anti-septic incision."

Same author, in "Treves' Manual of Surgery," 1886, vol. II, pp. 237, 238: "Should suppuration ensue the matter must be evacuated antiseptically. In arthritis secondary to disease in the articular ends of the bones, amputation may be called for. It can, however, as a rule, be avoided, by freely opening, washing out and draining the joint; by maintenance of complete rest, and the continued use of antiseptics."

I take the liberty of copying a part of an admirable editorial from the *Medical News*, Philadelphia, March 3, 1888, as it sums up the treatment of the effusion into joints. "An examination of our text-books shows that splints, rest, extension, compression, and revulsives are the agents mainly relied upon to effect a cure, followed in cases of serous effusion as a last resort, by puncture and the elastic bandage, and in pyarthrosis, by incision and drainage."

In the *Centralblatt fur Chirurgie*, of December 8, 1877, Rinne describes antiseptic irrigation of the joints for these lesions, and illustrates his paper by nineteen examples of washing out the knee-joint with a three or five per cent. carbolic solution, derived from the practice of Schede. The operation consists briefly, in excavating—under strict aseptic precautions—with a trocar or aspirating needle, the contents of the joint, distending the latter with the

solution for a few times, and then by rubbing, and kneading, and alternate movements of flexion and extension, the joint being half filled, bringing the fluid in contact with every portion of the synovial membrane. The washing out is continued until the fluid returns clear. A splint, and the usual outer dressings are applied for six or eight days. Passive motion is then instituted, until two weeks, as a rule, have expired, when the patient is discharged, but enjoined to wear a flannel bandage for a few weeks. If on removing the dressings there is a fresh effusion, complete rest with compression is kept up for several additional days, before resorting to passive motion.

The cases pursued—first, an afebrile or slightly febrile course without relapse; secondly, a moderately acute inflammation was set up, resulting in fresh effusions, which, however, rapidly disappeared; and, thirdly, in old cases with thickening of the capsule and perisynovial tissues and stretching of the ligaments, the effusion persisted and the operation had to be repeated.

A study of the cases shows that this simple and absolutely safe procedure should replace the other more tedious and frequently highly unsatisfactory method in all examples of acute, sub-acute, and chronic synovitis, whether serous, serofibrinous, or purulent, as well as of acute hæmarthrosis, and of tubercular inflammation in its early stage.

The paper of Rinne appears to have been either overlooked or to have been regarded with suspicion, since we do not find that primary antiseptic flushing of the joints is even referred to in our standard surgical text-books and manuals. This is to be the more regretted, as a more extended experience has fully confirmed the results attained by Schede, and demonstrated that the operation is as harmless as that of injecting a hydrocele, and that it

may, in many instances, do away with incision and drainage.

In the *Deutsche Zeitschrift fur Chirurgie*, Bd. XXVII, Hefte 1 and 2, Hager presents a large array of cases derived mainly from the General Hospital, at Hamburg, which substantiate the statements made in the preceding paragraph. Taking the knee-joint as an illustration of the practice, we glean the following pregnant facts: Of 100 examples of ordinary dropsy all were cured with the exception of one occurring in a tuberculous subject, and in only four was a repetition of the operation required.

Many other instances are quoted in this article, too long for entire transcription; the editorial ends as follows: "A review of the foregoing facts shows that of 168 cases of aseptic flushing of the knee, all recovered, and that of thirty examples of purulent effusion in only one did the procedure fail, thereby demonstrating that it should be resorted to before employing incision with drainage. These results are so brilliant that it is to be hoped that the treatment will be fully tested."

Gerster, in "Aseptic and Antiseptic Surgery," 1888, p. 73: title: "Operations About Non-suppurating Joints," describes the puncture and irrigation of the knee-joint, for chronic hydrops, which he says is often benefited, or even cured by puncture and subsequent irrigation.

Schede's rule of using corrosive sublimate (1-1000) when the synovial fluid is turbid, and carbolic lotion (three per cent.) when it is clear, are recommended. Two large-calibered trocars, antiseptically prepared, are thrust into either side of the joint, the fluid contents evacuated, the cavity first washed out with Thiersch's solution of salicylic acid, 2; boracic acid, 12; hot water, 1000 parts; and when the joint is cleared it is flushed with either cor-

rosive sublimate or carbolic solution, as above indicated. The joint is emptied by external pressure and flexion. The openings covered with iodoform gauze and the limb is placed at rest.

The operation of erosion or arthrectomy of the knee-joint, a procedure occupying a place between the free incision of the joint and removal by the scoop and other means, of the diseased portions, and excision of the knee-joint, is very fully described and discussed by A. Marmaduke Shield, of London, in the *Annals of Surgery*, for February, 1888. The operation as recommended, consists in a large anterior horse-shoe incision, sparing, if possible, the lateral ligaments, but dividing the ligamentum patellæ, which afterwards is united by catgut suture. The joint should be opened so that free access can be had to every part for examination. Every fragment of unhealthy synovial tissue must be removed. Diseased cartilage is to be pared away, and carious bone removed with a gouge. After this the limb is fixed upon a splint and the ends of the bones sutured, or not, according to the fancy of the operator.

In discussing the merits and disadvantages of the operation of erosion of the knee, from an argumentative point of view, the author says, "I shall be as brief as is consistent with clearness of expression. If arthrectomy be limited to the removal of the diseased synovial membranes only, the articular surfaces and ligaments being left intact, it is obvious that the number of cases in which the operation is justifiable or admissible must be strictly limited to cases of pure synovial disease.

" Many of these may be treated by milder measures than those of operation. In this strict sense, the number of cases in which erosion is justifiable are few and far between. But if, as it appears to be more commonly the

case, diseased cartilage is shaved away from the bone ends and suspicious or obviously diseased portions of osseous tissue scooped out with gouge and osteotrite, it is fair to state that the operation is really one of modified excision. It is in this latter sense that I would especially discuss and regard it.

“ But then it will be asked in what way does this proceeding claim superior advantage to excision? I would reply that in excision the cut surfaces of bone are larger, and the reparative process more severely taxed. The subsequent growth of bone is interfered with, and the operation is often more extensive than the local disease demands. * * * The greatest essential to the union of wounds generally, more especially of osseous tissue, is complete rest, with absolute apposition and fixation of the parts implicated.

“ The operation of erosion of the knee differs from excision mainly in the more limited operative dealings with the bone ends. In excision a large lamina of bone is removed—in erosion the diseased tissue is gouged away. In the first, growth is apt to be arrested—in the second, it should not be interfered with.”

Failure after erosion of the knee-joint is due very often, as claimed by Mr. Shield, to the fact that the ends of the femur and tibia are not held absolutely and quietly in apposition after the operation, or because of attempts to produce a movable joint, in which case a chronic flexure is apt to be produced.

In this paper we have no time or space to discuss excision of the knee for joint disease. The cases in which the operation could be demanded would, in all probability, have a much better chance of recovery after amputation.

In the exhaustive paper, H. Cuthbertson, Prize Essay American Medical Association, 1876, on “ Excision of the

Larger Joints," after giving the statistics of 631 cases of excision of the knee-joint for disease or injury, the following conclusion is arrived at: "That in excisions for gunshot wounds and for 'disease,' an exhausted state of the system favors mortality after this operation; and that in excisions for 'injuries' and deformities the data here shown are not reliable, because almost all the patients suffering from this operation, *for these causes*, were in a 'vigorous' state when the measure was executed."

The treatment of fibrous ankylosis by brisement forcé demands a few words, to emphasize a plan of treatment described by Dr. Sayre, and which the writer has practiced and seen used many times without an unfavorable result—anæsthesia always being employed. All active symptoms having subsided, the patella having still some motion, or having been removed from its attachment to the femur by pressure or directly applied force, carefully used and tenotomy performed when necessary. The joint is relieved of its adhesions by thorough flexion and extension until freedom of motion is restored at that time. The whole limb, from the toes upward, is snugly encased in bandage, and pressure made upon the femoral artery by a piece of wet sponge bandaged over it, to prevent a full supply of blood to the knee. The limb is then made absolutely immovable; extension and cold dressings applied. At the end of a week the bandages are removed and slight motion given. The bandages and extension are reapplied for a few days when passive motion can be regularly used, and after the knee has been protected by a suitable apparatus the patient can be allowed to walk about.

Having trespassed so long upon your time, the subjects of loose bodies within the knee-joint, their removal by the direct or indirect method, cysts about the joint,

internal derangement of the articulation by displacement of one of the semilunar cartilages, osteotomy for knock-knee or for bony ankylosis, and the modern operative treatment of tubercular joint affections, will not be discussed. The latter subject is fully considered by Dr. A. G. Gerster, in the April (1888) number of the *Annals of Surgery*.

The mechanical appliances in the treatment of knee-joint affections will now briefly be considered.

It is not my purpose to array before you the numerous devices whose only mission seems to be to illustrate the pages of the catalogues of instrument makers, being so complex and complicated in the construction as only to be understood by their inventors, if understood at all, but I will mention such instruments which seem to the writer to have the qualities of utility, practibility and simplicity, such as any surgeon with ordinary mechanical skill and proper care could satisfactorily and easily apply.

Passing over the early stage of knee-joint disease to the time when effusion has taken place, we come to the first mechanical means used (after the posterior splint has been applied to the whole limb to secure absolute rest), namely, elastic compression. This is well performed by Dr. Sayre's elastic bag, which can be distended so as to give the required pressure after it has been placed around the joint. For the same purpose, Martin's elastic bandage can be satisfactorily used. In "Transactions of American Medical Society," 1877, p. 601, Dr. Martin describes fully its uses in the stage of effusion, as well as in primary injuries of the joint. If elastic pressure fails, the fluid in the joint can be removed by the aspirator of Dieulafoy, provided the contents of the joint are fluid enough to pass through the canula, if not, by free incision or

the use of the double trocar, recommended by Gerster, as above quoted.

An interesting account of the pneumatic aspiration of the knee-joint will be found in the third chapter, p. 293, of Dieulafoy's book on "Pneumatic Aspirations," with a table showing the results in fifty cases. As soon as the disease has become sub-acute or chronic, and any evidence of structural change or reflex contraction of the muscles of the limb presents itself, extension and counter-extension, continuously applied, is one the chief remedial agents. This is to be made by the weight and pulley, which Holmes, in his work on "Surgical Treatment of Children's Diseases," p. 431, says originated with Sir Benjamin Brodie, "but which had fallen into disuse since his time." This appliance must be used while the patient is in bed.

After the pain and reflex contraction of the muscles have been overcome, a splint or brace, which will allow the patient to move about in the air and sunshine, while the inflamed surfaces of the joint are prevented from being pressed together by the weight of the body, must be employed. In the use of either method "the important point to be remembered is, that you can do a great deal of harm by making too much tension upon the lateral ligaments. The point to be aimed at is, to make just sufficient extension and counter-extension to give perfect relief from all pain by pressure upon the articular surfaces of the joint and no more."—"Sayre's Orthopædic Surgery," p. 204. The detailed account of making this extension, while the patient is in bed, so as to relieve this pressure and to overcome any posterior luxation of the tibia, is fully given in Sayre's work.

Howard Marsh, of London, in his recent work on "Diseases of Joints," and in his monograph in "Treves'

Manual of Surgery," fails to place this important remedy on record with the prominence it deserves. The same criticism can, in a great measure, be made of Richard Barwell's article on "Diseases of the Knee-joint," in "Ashurst's Encyclopædia."

There are but three instruments for diseases of the knee-joint which we will consider. First is Dr. Sayre's, which consists of two sheet-steel bands or collars, connected by two lateral bars so constructed that they can be lengthened or shortened as required. The bands opening by a hinge behind are applied above and below the diseased knee-joint, to the thigh and leg which have been prepared with adhesive plaster by which the bands are fastened to the limb. Afterwards the lateral bands are extended sufficiently to give the required relief. The details of the use of this excellent apparatus will be found in "Sayre's Orthopædic Surgery," Second Edition. It has been used by Dr. Sayre since 1845, and it has been my privilege to witness admirable results from its application.

Second. Dr. C. F. Stillman's sector splint. This splint was presented to this Society at its annual meeting in Princeton, in 1880, and at the meeting of the American Medical Association, at Richmond, Va., in 1881. A detailed account of its construction, which is very simple and perfect, and its application will be found in the Transactions of the two Societies. Dr. Stillman justly claims for it:

1. Extension at any angle, with motion.
2. Extension at any angle, with fixation.
3. Fixation at any angle.
4. Motion complete or limited—constant or occasional.
5. Exposure of surface about the joint—admitting

compression, elastic or otherwise, hot or cold applications, blisters, dressings, and easy inspection.

Having had a large experience in the use of this splint I cannot say too much in its favor. It is most satisfactory, if intelligently used.

Third. The splint of Hugh Owen Thomas, of Liverpool, which has been for some years regarded with especial favor in England. Dr. V. P. Gibney, of New York, in a paper read before the New York Clinical Society, reported in the *New York Medical Journal*, March 17, 1888, speaks very highly of it. He describes it as "a perineal crutch, with means of fixing the joint." It consists of two lateral iron rods extending from the hip, at which point the perineal crutch is attached, to three or four inches below the foot. The foot of the sound side is raised upon a crutch shoe, to correspond to the length of the opposite side, and crutches are used in walking. Dr. Gibney claims the joint is immobilized by it; but the same result can be obtained by Sayre's or Stillman's splint, and without the use of crutches. A great objection to this apparatus is, that in the effort to keep the inflamed surfaces of the knee-joint apart the hip and ankle-joints are in extension, when it should be only applied to one.

In considering so extensive and important a subject as the review of the surgery of the knee-joint, for the last fifty years, there have been very many interesting details, which from want of time and space I have been forced to omit. The bibliography of the subject is so immense that it would be impossible, within the limits of a single essay, to give any idea of the large amount of material, in the English alone, which is worthy of consideration.

